CLAIMS

1. A method of making single-wall carbon nanotubes which comprises:

(a) making a vapor comprising carbon and one or more Group VIII transition metals by vaporizing a mixture of carbon and one or more Group VIII transition metals with a first laser pulse;

(b) then condensing the vapor to form a single-wall carbon nanotube having a live end;

(c) then supplying carbon vapor to the line end of the single-wall carbon nanotube while maintaining the live end of the single-wall carbon nanotube in an annealing zone.

2. A method in accordance with claim 1 wherein the one or more Group VIII transition metals are selected from the group consisting of cobalt, ruthenium, nickel and platinum.

3. A method in accordance with claim 3 wherein the annealing zone is maintained at a temperature of 1000° to 1400°C and pressure of 100 to 800 Torr.

4. A method in accordance with claim 3 wherein the annealing zone atmosphere comprises carbon and a gas selected from the group of argon, neon, helium, carbon monoxide, and mixtures thereof.

5. A method in accordance with claim 4 wherein the annealing zone atmosphere consists essentially of carbon, one or more transition metals selected from the group consisting of iron, cobalt, ruthenium, nickel and platinum and a gas selected from the group of argon, neon, helium, ~~carbon~~ monoxide, and mixtures thereof.

6. A method in accordance with claim 1 wherein the step of making a vapor comprising carbon and one or more Group VIII transition metals further comprises a second laser pulse timed to arrive after the finish of the first pulse and before the vapor made by the first laser pulse has dissipated and focused so that the energy from the second laser pulse is absorbed by the vapor.

7. A method of making single-wall carbon nanotubes which comprises:

vaporizing carbon and one or more Group VIII transition metals with a laser, transporting the vapor so formed through an annealing zone, condensing the vapor, and recovering single-wall carbon nanotubes from the material that condenses from the vapor.

8. A method in accordance with claim 7 wherein the one or more Group VIII transition metals are selected from the group consisting of iron, cobalt, ruthenium, nickel and platinum.

9. A method in accordance with claim 8 wherein the carbon and one or more Group VIII transition metals are mixed together to form a target that is struck by a laser beam to produce the vapor.

10. A method in accordance with claim 9 wherein the carbon target is maintained in an annealing zone.

11. A method in accordance with claim 10 wherein the annealing zone is maintained at a temperature of 1000° to 1400°C., the annealing zone is maintained at a pressure of 100 to 800 Torr., and the annealing zone atmosphere consists essentially of carbon, one or more transition metals selected from the group consisting of iron, cobalt, ruthenium, nickel and platinum,

and a gas selected from the group consisting of argon, neon, helium, carbon monoxide and mixtures thereof.

12. A method of making carbon nanotubes which comprises:

(a) making a vapor comprising carbon by using a first laser pulse to ablate material from a target comprising carbon and then using a second laser pulse timed to arrive at the target after the end of the first laser pulse and before the material ablated by the first laser pulse has dissipated and focused so that the energy from the second laser pulse is absorbed by the material ablated from the target by the first laser pulse to form a vapor; and

(b) condensing the vapor to form carbon nanotubes.

13. A method in accordance with claim 12 wherein the second laser pulse arrives at the target within a delay of from about 20 nanoseconds (ns) to about 60 ns after the end of the first laser beam.

14. A method in accordance with claim 13 wherein the target further comprises one or more Group VIII transition metals.

15. A method in accordance with claim 14 wherein the one or more Group VIII transition metals are selected from the group consisting of iron, cobalt, ruthenium, nickel, and platinum.

16. A method in accordance with claim 15 wherein the vapor is condensed to form single-wall carbon nanotubes having a live end.

17. A method in accordance with claim 16 which further comprises maintaining the live end of the single-wall carbon nanotube in an annealing zone and supplying carbon vapor to the live end of the single-wall carbon nanotube.

18. A method in accordance with claim 17 wherein the target comprises 0.1 to 10 atom percent of one or more Group VIII transition metals selected from the group consisting of iron, cobalt, ruthenium, nickel, and platinum.

19. A method in accordance with claim 18 wherein the annealing zone is maintained at a temperature of from about 1000°C. to about 1400°C., and the pressure in the annealing zone is maintained at about 100 to about 800 Torr.

20. A method in accordance with claim 19 wherein the annealing zone is maintained in an atmosphere comprising carbon, and a gas selected from the group of argon, neon, helium, carbon monoxide and mixtures thereof.

21. A method in accordance with claim 19 wherein the delay is from about 40 ns to about 50 ns.

22. A single-wall carbon nanotube product made in accordance with any of the methods of claims 12, 13, 14, 15, 19 or 21.

23. A rope of single-wall carbon nanotubes having 50 to 5000 single-wall carbon nanotubes of which greater than 10% are (10, 10) single-wall carbon nanotubes.

24. A rope of single-wall carbon nanotubes in accordance with claim 23 wherein more than 50% are (10, 10) single-wall carbon nanotubes.

25. A rope of single-wall carbon nanotubes in accordance with claim 24 wherein more than 90% are (10, 10) single-wall carbon nanotubes.

26. A rope of single-wall carbon nanotubes in accordance with claim 25 wherein the rope comprises 100 to 500 single-wall carbon nanotubes.

27. A rope of single-wall carbon nanotubes in accordance with claim 26 wherein the average diameter of all single-wall carbon nanotubes in the rope is 13.8 Å ± 0.3 Å.

28. A rope of single-wall carbon nanotubes in accordance with claim 26 wherein the average diameter of all single-wall carbon nanotubes in the rope is 13.8Å ± 0.2 Å.

29. A rope in accordance with claim 28 wherein the 2-D triangular lattice constant is 17Å.

30. A rope of single-wall carbon nanotubes in accordance with claim 23 comprising about 100 to about 500 single-wall carbon nanotubes of which greater than 50% are single-wall carbon nanotubes of the armchair form.

31. A rope of single-wall carbon nanotubes in accordance with claim 30 wherein greater than 75% of the single-wall carbon nanotubes are of the armchair form.

32. A rope of single-wall carbon nanotubes in accordance with claim 31 wherein greater than 90% of the single-wall carbon nanotubes are of the armchair form.

33. A rope of single-wall carbon nanotubes in accordance with claim 30 wherein the ropes are produced by using solar energy to vaporize the carbon that forms the single-wall carbon nanotubes.

34. A felt of ropes of single-wall carbon nanotubes.

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